

Appl. No. 10/604,253  
Amdt. dated March 11, 2005  
Reply to Office action of January 11, 2005

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the application:

**Listing of Claims:**

- 1 (original): A printing apparatus comprising:
- 5 a printhead for ejecting ink from a plurality of nozzles, the printhead comprising:  
a substrate; and  
a plurality of heaters arranged on the substrate for heating ink in the printhead  
to generate bubbles in the ink and eject the ink through the corresponding  
nozzles;
- 10 a signal generator for generating printing pulses and non-printing pulses used to  
control the heaters, the printing pulses controlling the heaters to generate  
sufficient heat energy to eject ink from the nozzles for printing data, and the  
non-printing pulses controlling the heaters to generate heat energy that is not  
sufficient to eject ink from the nozzles for raising a temperature of the ink;
- 15 a print data comparator for comparing a percentage of data printed during a  
predetermined period of time with a threshold value; and  
a control circuit for varying the non-printing pulses generated by the signal generator  
according to the percentage of data printed during the predetermined period of  
time and the threshold value.
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- 2 (original): The printing apparatus of claim 1 wherein if the percentage of data printed  
during the predetermined period of time is above the threshold value, a width of the  
non-printing pulses generated by the signal generator is lowered, and if the  
percentage of data is below the threshold value, the width of the non-printing pulses  
25 generated by the signal generator is raised.

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- 3 (original): The printing apparatus of claim 1 wherein the control circuit varies a frequency of the non-printing pulses generated by the signal generator according to the percentage of data printed during the predetermined period of time, wherein if the percentage of data is above the threshold value, the frequency of the non-printing pulses generated by the signal generator is lowered, and if the percentage of data is below the threshold value, the frequency of the non-printing pulses generated by the signal generator is raised.
- 4 (original): The printing apparatus of claim 1 wherein the control circuit varies a number of the non-printing pulses generated by the signal generator according to the percentage of data printed during the predetermined period of time, wherein if the percentage of data is above the threshold value, the number of the non-printing pulses generated by the signal generator is lowered, and if the percentage of data is below the threshold value, the number of the non-printing pulses generated by the signal generator is raised.
- 5 (original): The printing apparatus of claim 1 wherein the control circuit varies a voltage of the non-printing pulses generated by the signal generator according to the percentage of data printed during the predetermined period of time, wherein if the percentage of data is above the threshold value, the voltage of the non-printing pulses generated by the signal generator is lowered, and if the percentage of data is below the threshold value, the voltage of the non-printing pulses generated by the signal generator is raised.
- 6 (original): The printing apparatus of claim 1 wherein the printhead further comprises a temperature sensor for measuring a temperature of the substrate and a temperature comparator for comparing the temperature of the substrate with a reference temperature.

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- 7 (original): The printing apparatus of claim 6 wherein the control circuit varies a frequency of the non-printing pulses generated by the signal generator according to a temperature difference between the temperature of the substrate and the reference temperature, wherein if the temperature of the substrate is above the reference temperature, the frequency of the non-printing pulses generated by the signal generator is lowered, and if the temperature of the substrate is below the reference temperature, the frequency of the non-printing pulses generated by the signal generator is raised.
- 8 (original): The printing apparatus of claim 6 wherein the control circuit varies a width of the non-printing pulses generated by the signal generator according to a temperature difference between the temperature of the substrate and the reference temperature, wherein if the temperature of the substrate is above the reference temperature, the width of the non-printing pulses generated by the signal generator is lowered, and if the temperature of the substrate is below the reference temperature, the width of the non-printing pulses generated by the signal generator is raised.
- 9 (original): The printing apparatus of claim 6 wherein the control circuit varies a number of the non-printing pulses generated by the signal generator according to a temperature difference between the temperature of the substrate and the reference temperature, wherein if the temperature of the substrate is above the reference temperature, the number of the non-printing pulses generated by the signal generator is lowered, and if the temperature of the substrate is below the reference temperature, the number of the non-printing pulses generated by the signal generator is raised.
- 10 (original): The printing apparatus of claim 6 wherein the control circuit varies a voltage of the non-printing pulses generated by the signal generator according to a temperature difference between the temperature of the substrate and the reference temperature, wherein if the temperature of the substrate is above the reference

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temperature, the voltage of the non-printing pulses generated by the signal generator is lowered, and if the temperature of the substrate is below the reference temperature, the voltage of the non-printing pulses generated by the signal generator is raised.

5 11-15 (cancelled).

16 (original): A method for heating a printhead in a printing apparatus, the method comprising the steps of:

providing a printing apparatus, including:

10 a printhead for ejecting ink from a plurality of nozzles, the printhead comprising:

a substrate; and

a plurality of heaters arranged on the substrate for heating ink in the printhead to generate bubbles in the ink and eject the ink through the  
15 corresponding nozzles;

generating printing pulses and non-printing pulses used to control the heaters, the printing pulses controlling the heaters to generate sufficient heat energy to eject ink from the nozzles for printing data, and the non-printing pulses controlling the heaters to generate heat energy that is not sufficient to eject ink from the  
20 nozzles for raising a temperature of the ink;

comparing a percentage of data printed during a predetermined period of time with a threshold value; and

varying the non-printing pulses according to the percentage of data printed during the predetermined period of time and the threshold value.

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17 (original): The method of claim 16 further comprising lowering a width of the non-printing pulses if the percentage of data printed during the predetermined period of time is above the threshold value, and raising the width of the non-printing pulses if the percentage of data printed during the predetermined period of time is below the

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threshold value.

18 (original): The method of claim 16 further comprising lowering a frequency of the  
non-printing pulses if the percentage of data printed during the predetermined period  
5 of time is above the threshold value, and raising the frequency of the non-printing  
pulses if the percentage of data printed during the predetermined period of time is  
below the threshold value.

19 (original): The method of claim 16 further comprising lowering a number of the  
10 non-printing pulses if the percentage of data printed during the predetermined period  
of time is above the threshold value, and raising the number of the non-printing  
pulses if the percentage of data printed during the predetermined period of time is  
below the threshold value.

15 20 (original): The method of claim 16 further comprising lowering a voltage of the  
non-printing pulses if the percentage of data printed during the predetermined period  
of time is above the threshold value, and raising the voltage of the non-printing  
pulses if the percentage of data printed during the predetermined period of time is  
below the threshold value.

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21-25 (cancelled).